Wireless Security

Solve Wireless Application Problem Involving RF

Weight: /1.15% Marks: /153

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# Introduction

In this lab, we focus on the WLAN network signal strength and RF impacts.

Lab activities in this course will be marked in class. You must bring this document to every lab in the module. All activities must be completed and then marked by the instructor before you move on to the next. To avoid a mark of zero for an activity, contact the instructor immediately if for any reason you cannot complete the activity or if the activity was left unmarked by the instructor.

# Equipment

* Wifi Inspector or Wifi Analyzer or NetSurveyor
* Or other tools that can provide RSSI or dBm measurements of wifi signal and network performance testing

# Lab Set Up

Before you begin the lab activities, perform the steps below to set up your computer.

Set up a Windows workstation or Android/IOS device the following parameters:

* Wireless Network Adapter
* Install WiFi tool

# Lab Activity 2.1: Wavelength, Frequency and ISM Band

Wavelength is measured in meters and refers to the distance between two (typically) crests or troughs.

|  |
| --- |
| By Dicklyon,Richard F. Lyon - Own work, *CC* BY-SA 3.0 Figure 1: https://commons.wikimedia.org/w/index.php?curid=7184592 |

now Wave *Velocity(c)= Wavelength (Lambda)\* Frequency(f)*

*Wavelength (Lambda) = Wave Velocity (c) / Frequency (f)*

*Frequency(f)* = Wave *Velocity(c)/ Wavelength (Lambda)* which gives us the number of cycles per second

For example a radio signal, travelling at approximately the light speed (c), has a frequency lM *Hz=* lxl06 = 1000000 and a wavelength of *c / freq= 300xl06mps/lxl06cps = 300m* where Msp is meters per second and cps is cycles per second.

This becomes very important as we look at antennas where full, quarter and half wavelengths are used in design and identification! Get use to the values, frequency estimation can be useful when looking at a target in the field.

Question: Fill in the tables (54 points)

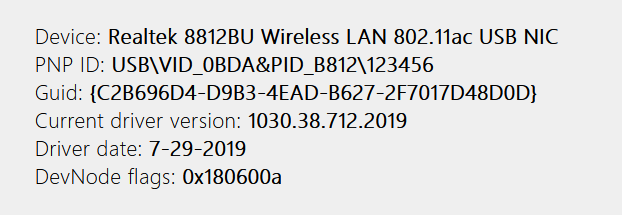
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Wavelength | half wavelength | quarter wavelength | Within ISM Band  (True/False) |
| 1 MHz | 300 m | 150 m | 75 m | False |
| 97.5 MHz | 3 m | 1.5 m | 0.75 m | False |
| 902 MHz | 30 cm | 15 cm | 7.5 cm | True |
| 15 MHz | 20 m | 10 m | 5 m | False |
| 100 MHz | 3 m | 1.5 m | 0.75 m | False |
| 3000 MHz | 10 cm | 5 cm | 2.5 cm | False |
| 2.4 GHz | 12 cm | 6 cm | 3 cm | True |
| 5.180 GHz | 6 cm | 3 cm | 1.5 cm | False |
| 5.825 GHz | 5 cm | 2.5 cm | 1.25 cm | True |
| 3.7 MHz | 80 m | 40 m | 20 m | False |
| 7.5 MHz | 40m | 20 m | 10 m | False |
| 27 MHz | 11.11 m | 5.55 m | 2.77 m | True |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Wavelength | 10 Wavelengths | 103 Wavelengths | 106 Wavelengths |
| 2.4 GHz | 0.125 | 1.25 | 125 | 125000 |
| 5.180 GHz | 0.05792 | 0.5792 | 57.92 | 57920 |
| 5.825 GHz | 0.05150 | 0.5150 | 51.50 | 51500 |

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

# Lab Activity 2.2: Verify with instructor the Wifi radiator

1. Once radiator identified (IdRad) and setup. (2 points)
2. Verify the software is working. (2 points)



**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

# Lab Activity 2.3: Identify the location of identified radiator (IdRad)

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

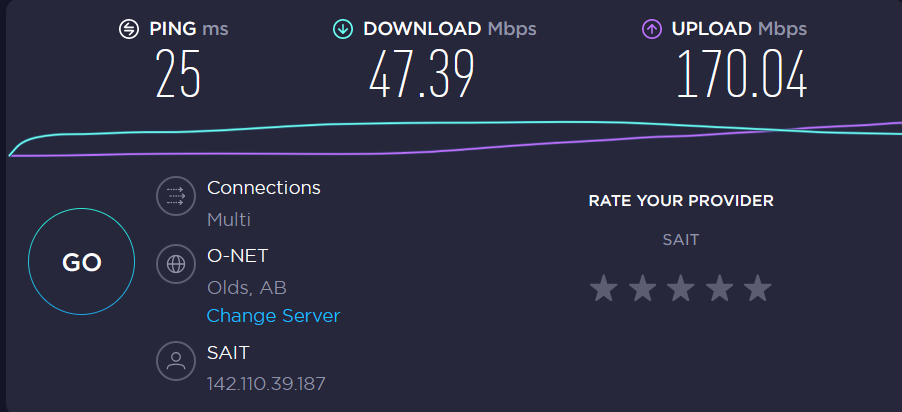


-dBm = (quality/2) – 100

-dBm = (80/2) – 100

-dBm = -60

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)



1. From performed wavelength calculations above (Section 6), go to next activity

With frequency at 5 GHz then the wave length is ~ 5 cm

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.4: Move 10 wavelengths from the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad at this location either directly above or below:

dBm = -68

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

64%

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.5: Move 50 wavelengths from the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -73.5

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

53%

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.6: Move 100 wavelengths from the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -58

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

84%

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.7: Move 150 wavelengths from the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -61

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

78%

If you haven’t moved outside of the classroom

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.8: Move outside of the classroom: wavelengths from the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -97.5

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

5%

Note: You should still be in direct view of IdRad when making this measurement

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.9: Move out of direct view of the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -75

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

50%

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.10: Move 3 m more out of direct view of the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -81

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

38%

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)

## Lab Activity 2.11: Move 3 m more out of direct view of the IdRad, Distance

1. Document RSSI or dBm and Channel of IdRad either directly above or below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

dBm = -67

1. Wifi performance testing:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

66%

1. How many walls are between you and IdRad? \_\_\_\_\_\_\_\_\_ (2 points)

About 3 walls

1. What other items may cause interference, explain:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2 points)

Other wifi signals, any physical object (such as tables and chairs and computers)

**Instructor sign-off:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 points)